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THE FOLLOWING ARE THE ENGLISH TRANSLATION OF ANNEXES TO THE INTERNATIONAL PRELIMINARY EXAMINATION REPORT (ARTICLE 34):

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polarization direction of a laser beam emitted from the laser diode 41, as shown in Fig. 5, there are two modes of a TE mode in which the electric field is polarized to the direction parallel to an active region layer (the direction vertical to the thickness direction of the active region layer), and a TM mode in which the electric field is polarized to the direction vertical to the active region (the direction parallel to the thickness direction of the active region layer). In their modes, noise is generated mutually not correlatively. Thus, there is a problem that a canceled amount lowers in optical systems having polarization dependency.

Disclosure of Invention

Considering the above points, the present invention has been done and is proposing an optical disk apparatus in that laser noise components of two orthogonal polarization components in a laser beam emitted from a laser light source (a TE wave of which the polarization direction is in the TM mode, and a TM wave of which the polarization direction is in the TM mode) can be certainly eliminated.

To obviate the above problems, according to the present invention, in an optical disk apparatus having a light separator for distributing a laser beam from a laser light source toward an optical disk and a light receiver for monitoring light source and reflecting a reflective light from the optical disk toward a light receiver for reproducing signal, transmittance and reflectance to the S polarization and the P polarization of the light separator are selected so that a first polarization component level ratio being the ratio of the level of a component corresponding to the TE component to the level of a component corresponding to the TM

component of the laser beam by that the reflective light from the optical disk was received by the light receiver for reproducing signal from the laser light source via the light separator, and a second polarization component level ratio being the ratio of the level of a component corresponding to the TE component to the level of a component corresponding to the TM component of the laser beam received by the light receiver for monitoring light source from the laser light source via the light separator become equal or the difference between the first and the second polarization component level ratios becomes within a predetermined permissible range, and the difference between a laser noise component received by the light receiver for reproducing signal and a laser noise component received by the light receiver for monitoring light source is obtained, so that a reproducing signal in that a desired amount of laser noise was canceled out is obtained.

As a result, in this optical disk apparatus, a reproducing signal in which laser noise components of the TE component and the TM component of a laser beam shot from the laser light source were surely eliminated or were restrained within a permissible range can be obtained.

Further, according to the present invention, in an optical disk apparatus having a light separator for distributing a laser beam from a laser light source toward an optical disk and a light receiver for monitoring light source and reflecting a reflective light from the optical disk toward a light receiver for reproducing signal, a polarizer for passing through either one of the TE component and the TM component of the laser beam emitted from the laser light source is provided between the laser light source and the light separator, by the polarizer, transmittance

and reflectance to the S polarization and the P polarization of the light separator are selected so that a first polarization component level ratio being the ratio of the level of a component corresponding to the TE component to the level of a component corresponding to the TM component of the laser beam by that the reflective light from the optical disk was received by the light receiver for reproducing signal from the laser light source via the light separator, and a second polarization component level ratio being the ratio of the level of a component corresponding to the TE component to the level of a component corresponding to the TM component of the laser beam received by the light receiver for monitoring light source from the laser light source via the light separator become equal, and the difference between a laser noise component received by the light receiver for reproducing signal and a laser noise component received by the light receiver for monitoring light source is obtained, so that a reproducing signal in that laser noise was canceled out is obtained.

As a result, in this optical disk apparatus, a reproducing signal in which laser noise components of the TE component and the TM component of a laser beam shot from the laser light source were surely eliminated can be obtained.

Brief Description of Drawings

Fig. 1 is a block diagram showing an embodiment of an optical disk apparatus according to the present invention.

Fig. 2 is an explanatory diagram showing the relationship between a noise component received by a light receiver for reproducing signal and a noise component received by a light receiver for monitoring light source, to a TE wave and a TM wave

in a laser diode (a laser light source) in this embodiment.

Fig. 3 is a block diagram showing another embodiment of an optical disk apparatus according to the present invention.

Fig. 4 is a block diagram showing a conventional optical disk apparatus in an LNC system.

Fig. 5 is an explanatory diagram for explaining a TE mode and a TM mode in a laser beam emitted from a laser diode.

Best Mode for Carrying Out the Invention

An optical disk apparatus in the best mode to carry out this invention is formed so that transmittance and reflectance to the S polarization and the P polarization of a light separator are selected so that the ratio of the level of a component corresponding to the TE component to the TM level of a component corresponding to the component of a laser beam received by a light receiver for reproducing signal from a laser light source via a light separator (hereinafter, this is referred to as a first polarization component level ratio), and the ratio of the level of a component corresponding to the TE component to the level of a component corresponding to the TM component of a laser beam received by a light receiver for monitoring light source from the laser light source via the light separator (hereinafter, this is referred to as a second polarization component level ratio) become equal, or the difference between the first and the second polarization component level ratios becomes within a predetermined permissible range, and the difference between a laser noise component received by the light receiver for reproducing signal and a laser noise component received by the light receiver for monitoring light source is obtained, so that a reproducing signal in that a desired amount of laser noise was

received by the light receiver for reproducing signal 17, and the aforementioned second polarization component level ratio being the ratio of the level of a component corresponding to the TE component to the level of a component corresponding to the TM component of a laser beam received by the light receiver for monitoring light source 18 are different. Thus, there is a problem that a canceled amount of laser noise lowers.

To obviate this, in this embodiment, transmittance and reflectance to the S polarization and the P polarization in the polarization beam splitter 13 is selected so that the above first polarization component level ratio of the laser beam received by the light receiver for reproducing signal 17 from the laser diode 11 via the polarization beam splitter 13 being a light separator, and the above second polarization component level ratio of the laser beam received by the light receiver for monitoring light source 18 from the laser diode 11 via the polarization beam splitter 13 become equal or the difference between the first and the second polarization component level ratios becomes within a predetermined permissible range, and the difference between a laser noise component received by the light receiver for reproducing signal 17 and a laser noise component received by the light receiver for monitoring light source 18 is obtained, so that a reproducing signal in that a desired amount of laser noise was canceled out is obtained. Hereinafter, the detail will be described with reference to Fig. 2.

Referring to Fig. 2, a vector 31 represents a laser noise component at an amplitude 1 received by the light receiver for reproducing signal 17, and a vector 32 represents a laser noise component at an amplitude 1 received by the light receiver for monitoring light source 18.

noise canceled amount Na satisfies the following expression:

$$[2\{1-\cos(\alpha-\beta)\}]^{1/2} = \{2(1-\cos\theta)\}^{1/2} \leqq Na \quad \ldots (8)$$

However, the laser noise canceled amount Na is represented by the ratio of the laser noise level after laser noise cancel to the laser noise level before the laser noise cancel (the laser noise level after the laser noise cancel/the laser noise level before the laser noise cancel).

Further, if transforming this expression (8) by the equations (3) and (4), it becomes as follows:

$$[\{2(1-\cos(\mathrm{Arctan}(1/(LDp \cdot RFpo))- \mathrm{Arctan}(1/(LDp \cdot FPDpo))))\}]^{1/2} \leqq Na \quad \ldots (9)$$

That is, this expression (9) is achieved by selecting the transmittance and the reflectance to the S polarization and the P polarization of the polarization beam splitter 13 so that the first polarization component level ratio RFp of the laser beam received by the light receiver for reproducing signal 17 from the laser diode 11 via the optical system including the polarization beam splitter 13 and the 1/4 wavelength plate 14, and the second polarization component level ratio FPDp of the laser beam received by the light receiver for monitoring light source 18 from the laser diode 11 via the polarization beam splitter 13 become equal or the difference between the first and the second polarization component level ratios RFp and FPDp becomes within a predetermined permissible range. That is, being able to come this expression (9) means that a reproducing signal in which a desired amount of laser noise was canceled out can be obtained.

CLAIMS

1. An optical disk apparatus having a laser light source, a light receiver for reproducing signal for receiving a reflective light from an optical disk of a laser beam by that said laser light source irradiated the optical disk and converting it into an electric signal, a light receiver for monitoring light source for detecting said laser beam from said laser light source, and a light separator for distributing said laser beam from said laser light source toward said optical disk and said light receiver for monitoring light source and reflecting said reflective light from said optical disk toward said light receiver for reproducing signal, wherein:

transmittance and reflectance to the S polarization and the P polarization of said light separator are selected so that a first polarization component level ratio being the ratio of the level of a component corresponding to the TE component to the level of a component corresponding to the TM component of said laser beam by that said reflective light from said optical disk was received by said light receiver for reproducing signal from said laser light source via said light separator, and a second polarization component level ratio being the ratio of the level of a component corresponding to the TE component to the level of a component corresponding to the TM component of said laser beam by that said laser beam from said laser light source was received by said light receiver for monitoring light source via said light separator become equal or the difference between the first and the second polarization component level ratios becomes within a predetermined permissible range; and

the difference between a laser noise component received by

said light receiver for reproducing signal and a laser noise component received by said light receiver for monitoring light source is obtained, in order to obtain a reproducing signal in that a desired amount of laser noises were canceled out.

2. The optical disk apparatus according to Claim 1, wherein;

the necessary value of a laser noise canceled amount Na is represented so that said difference between the first and the second polarization component level ratios becomes within said permissible range, by the following expression of relation:

$$[\{2(1-\cos(\mathrm{Arctan}(1/(LDp \cdot RFpo))-\mathrm{Arctan}(1/(LDp \cdot FPDpo))))\}]^{1/2} \leqq Na \quad \ldots (1)$$

however,

Na: the noise level after laser noise cancel/the noise level before the laser noise cancel,

LDp: the ratio of the level of TE component to the level of the TM component of the laser beam emitted from said laser light source,

RFpo: the ratio of the transmittance of a component corresponding to said TE component to the transmittance of a component corresponding to said TM component of said laser beam from said laser light source to said light receiver for reproducing signal, that is determined by said light separator existing on the optical path between said laser light source and said light receiver for reproducing signal,

FPDpo: the ratio of the transmittance of a component corresponding to said TE component to the transmittance of a component corresponding to said TM component of said laser beam from said

by said polarizer, transmittance and reflectance to the S polarization and the P polarization of said light separator are selected so that a first polarization component level ratio being the ratio of the level of a component corresponding to the TE component to the level of a component corresponding to the TM component of said laser beam by that said reflective light from said optical disk was received by said light receiver for reproducing signal from said laser light source via said light separator, and a second polarization component level ratio being the ratio of the level of a component corresponding to the TE component to the level of a component corresponding to the TM component of said laser beam by that said laser beam from said laser light source passed through said light separator and said reflective light from said optical disk was received by said light receiver for monitoring light source become equal or the difference between the first and the second polarization component level ratios becomes within a predetermined permissible range; and

the difference between a laser noise component received by said light receiver for reproducing signal and a laser noise component received by said light receiver for monitoring light source is obtained, in order to obtain a reproducing signal in that laser noises were canceled out.

6. The optical disk apparatus according to Claim 5, wherein; said light separator is a polarization beam splitter.